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U.S. RAILROADS--A MILITARY ASSET

BY

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U.S. RAILROADS -- A MILITARY ASSET

AN INDIVIDUAL ESSAY PROJECT

by

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ABSTRACT

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U.S. railroads collectively are the largest volume haulers of domestic freight both in peace and at war. However, the rail industry today is essentially only capable of carrying freight at the current peacetime levels and is not capable of increasing this volume as fast as would probably be required during a total mobilization. If this increase is greater than the rails can absorb, then other less efficient users of energy and personnel resources will be required to carry this additional freight. Strategic planners must allocate scarce resources to provide an economical means to achieve the domestic transport end. This is not being done and, as a result, this nation will expend more scarce resources than is necessary in a total mobilization. The U.S. railroads are a military asset and strategic planners need to be aware of the capabilities of domestic rail freight service in the event of a total mobilization.

U.S. RAILROADS -- A MILITARY ASSET

Are U.S. railroads a thing of the past in our nation's defense, or are they a most vital resource in the conduct of strategy attaining our national objectives? In this age of missiles, jet airplanes and an interstate highway system, visible evidence to the public appears that our nation's railroads would be a secondary transportation system in support of our armed forces in a major conflict. But nothing could be further from the truth! Without the use of a thoroughly modern and efficient U.S. railway system, this country would be hard pressed, if not unable, to provide required transportation of defense materiel without an exorbitant expenditure of energy and manpower that we do not have enough of.

Our insatiable appetite of energy is now critical in peacetime and the lack of petroleum would be near catastrophic in a major conflict. Use of our highly developed and extensive continental United States railway system is our strategic planner's only option to maximize this country's utilization of dwindling energy resources in time of national emergencies to carry necessary war and domestic goods.

To better appreciate the use of railroads in time of war, a look into recent history will be very revealing.

USE IN PAST WARS

America's railroads have been an integral part in supporting our military in peace and war from the Mexican War onward. The American Civil War was the first war in which this country fully demonstrated the military potential of its railroads and formulated the principles of military railroading. Through the Indian Wars of the West, the Spanish American War and into the twentieth century, railroads became more and more essential to the outcome of conflicts. World War I brought to the forefront the criticality of railroads to the outcome

of modern age warfare, while World War II (WWII) vividly demonstrated U.S. railroads central transportation role in this nation's march to victory during a total mobilization.¹

How essential and to what extent was this nation's railways' transportation role in WWII? In this nation's greatest effort for survival, U.S. railroads moved 90 percent of all war freight, 70 percent of all freight moved in this country, and carried 97 percent of all organized military passenger travel.² In the late war years, total freight and passengers, both civilian and military, was almost double that of any prewar year maximum in the entire history of U.S. railroading. And the rail industry did this with one-third fewer locomotives and passenger cars, and one-fourth fewer freight cars than in World War I.³ This was possible due to the application of advanced technology, scientific improvements, modernization, and having excess capacity of this nation's railroads in peacetime. Key here is that the industry had spent vast sums on capital improvements that allowed increased capacity with less assets. Thus the railroads are ready and capable of its central transportation role in the Continental United States (CONUS) for World War II.

More recently, our involvement in limited wars have continued the movement of military freight by rail. By the end of the Korean Conflict about 80 percent was being moved while during the Vietnam Conflict U.S. rails moved about half of the war freight.⁴ CONUS passenger movements of troops has decreased significantly to less than five percent for the Vietnam Conflict.⁵ These latest wars, however, still indicate that most defense-related freight traffic can be best moved by rail because of the bulk and tonnage handled.

SUPERIOR ECONOMY OF RAIL

The basic premise to the wartime importance of this nation's railroads is its superior economy in the use of fuel and manpower. Rail's superior economy

is crucial during times of defense emergencies when all resources are being devoted to national survival. Therefore it is imperative that we not lose sight of this importance and ensure that the railroads can meet our future defense needs in times of national emergencies and mobilizations.

What railroads do mean to American in war is that they produce a good return in ton-miles of freight hauled for a given commitment of fuel and manpower. U.S. railroads carry about twice as much freight per gallon of fuel as the intercity truckers do and sixteen times as much as air freight can.⁶ As for manpower, the railway industry handles many times more freight traffic per employee per year than the intercity truckers and the airline industry do.⁷ Oil pipelines and barge traffic are very energy efficient; however, the former is highly specialized and the latter is a slower mode. But this truly indicates how the faster modes of transportation use considerably more resources than railroads do for a given amount of freight hauled.

Mobilization can cause a shift of the volume of intercity freight traffic each CONUS mode of transportation will handle. Likewise, the U.S. rail industry could be expected to receive a tremendous increase in traffic if one mode of domestic transport is significantly disrupted as in WWII when the submarine threat almost shut down domestic coastal shipping. Table 1 shows what the U.S. transportation industry contributed to the WWII war effort and how the U.S. railroads met the challenge of absorbing a greatly expanded freight volume.

In 1944, the total intercity freight ton-miles by all forms of transportation, to include domestic coastwise and intercoastal, increased by some 13 percent over 1941, the last U.S. pre-war year. U.S. railroads had increased its freight hauling by almost 53 percent in the same period meaning that other forms of transportation received a varying proportion of this total freight traffic. Specifically, truck ton-miles declined by 25 percent while coastwise and intercoastal decreased by 75 percent. Only pipelines, as a non-rail form of

transportation increased through an increase of pipelines constructed during the war years.⁸

The Office of Defense Mobilization (ODM) conducted a study in 1955 to ascertain defense requirements for a then foreseen mobilization. Table 2 explains that study's anticipated requirements for a mobilization. ODM estimated that the third year of mobilization would increase the total intercity freight traffic for all forms of transportation by some 19 percent above the base year of 1953. It was further estimated that the U.S. railroads would experience almost a 67 percent increase in freight traffic. ODM forecasted a slight decrease in intercity truck traffic, a drastic drop in coastwise and intercoastal shipping, a slight increase in inland water traffic and a significant jump in pipeline tonnage. Generally these estimates revealed the expected role to be played by each mode would remain basically proportional to that of WWII. The type of traffic generated by a mobilization and the greater reliance on land forms of transport (as opposed to the more hazardous coastal mode) will mean an even greater need for a U.S. railroad industry expansion to meet an emergency.

Are the U.S. railroads capable of meeting a national emergency on the scale of a total mobilization like WWII or anticipated in 1955?

WARTIME POTENTIAL

The U.S. rail industry today is more productive in terms of ton-miles of freight hauled than at the height of WWII. As indicated in Table 3, a volume of 839 billion ton-miles of freight was moved by the railroads in 1983. This is 28.1 percent of the domestic freight traffic volume by all transport modes to include coastal and intercoastal. Very significantly, the railroads still constitute the largest single mode of transport in the U.S. as a whole. But it must be emphasized that the rail industry does not dominate as it once did and

there is now more balance between all the now well-developed different forms of transport.

Then the pertinent question is: What is the capability of U.S. railroads to expand its volume to absorb an increasing wartime traffic as well as any shifts of traffic from other modes? The strategic planner has to know this capability in its totality--not just to support one contingency plan. A national mobilization would mean a wartime economy and commitment of resources to the most effective programs such as the most effective transport means within capabilities to achieve an end. Railroads, then, should be analyzed in detail to determine their wartime potential. This paper attempts to provide a framework that can be a basis to ascertain the railroad's relative capabilities to expand its capacity in wartime.

To determine this capacity, it is necessary to establish a model to evaluate this railroad buildup over a three-year period (table 4). This model essentially determines the carrying capacity of the freight car fleet based on the cars' utilization record. Some assumptions had to be made; however, all are realistic and within reason. The new car builders capacity is now about 77,500 and for each year of mobilization could be increased at about 10 percent per year. Each year car retirements will occur--in this case 25,000 annually which is less than half the annual retirements in peacetime. The bad order ratio is restricted data of the rail industry, so slightly less than three percent (45,000) is used here. The average tons per loaded car, length of haul and days turn-around are slightly better than the industry average of 1983. In a mobilization these would get somewhat better if a look back into history is accurate.

By the model in table 4, the railroads' increased freight volume capacity can be determined for each year of mobilization. At the end of the first year of mobilization, the railroads could haul about 968.9 billion ton-miles of freight, an increase of 15.5 percent above 1983. After the third year, it is

possible for the rails to carry about 36 percent more annually above the base year level. What is significant is that the U.S. railroads can absorb some of the increased U.S. freight volume generated by mobilization. This total increase is assumed to be about 15 percent with greatly changing traffic flows and commodity quantities. A 15 percent increase in total U.S. freight traffic volume is 448 billion ton-miles. For the U.S. railroads to absorb all of this would represent a 54.8 percent increase for rails. The bottom line is that the railroads cannot expand enough to absorb all of a wartime increase. Furthermore, the rails would be hard pressed to help absorb traffic diverted by hostilities from any other disrupted or interdicted mode.

Today there are about 1.5 million cars for revenue freight service on U.S. railroads.⁹ As can be seen in table 4, the current freight car fleet is only capable of generally hauling today's rail freight requirements and that the U.S. railroads have a very limited capability during mobilization to assume a greater proportion of the intercity freight tonnage. The reason for this inability is the lack of freight cars in existence and the incapability to build additional ones fast enough to create the excess capacity needed by U.S. railroads for mobilization. The equipment utilization predicted in table 4 is optimistic, but not impossible, which means under very favorable conditions U.S. railroads can only increase its freight volume by about 36 percent. The exact figure is not important but the relatively small increase to that really needed for a mobilization is very significant.

There were some 159,123 route miles of railroad in 1983 within the 48 contiguous states. This means that about 6 trains per mile per day is operated on each route mile of road in freight service.¹⁰ This still represents a lot of potential track capacity. The U.S. rail system is a very extensive network that was perhaps over-developed and is now being "pruned back" to a more realistic size that is more profitable to the individual companies. However, this

extensive network of tracks has a degree of redundancy that adds a great deal of flexibility to a wartime situation.

Over the years much of the railroad system has had many improvements such as Centralized Traffic Control, modern classification yards, communications systems, computerization and other advanced technologies installed that greatly increase the present system's capacity and efficiency. Today there is extensive reconditioning of the current physical plant after a couple decades of deferred maintenance. Thus it appears that the main trackage and yard facilities are adequate for the increases expected from a total mobilization provided these programs of improvements and maintenance are continued.

Motive power requirements likewise will be met with existing units plus those to be produced as required for mobilization. Our motive power builders have the ability to manufacture enough units annually to meet the anticipated increase. Also any motive power units being stored serviceable can be activated readily for service in the short run until the locomotive builders begin to make deliveries for a build up.

As for manpower, the last category to consider, there has to be sufficient personnel resources allotted to the U.S. railroad industry to achieve the increased efficiency needed in a mobilization. To meet the demands for railroad equipment and traffic loads foreseen previously in this article will mean a level of efficiency very difficult to attain by the industry. If the railroads are not permitted to have sufficient personnel resources, which have not always been given adequate consideration in previous conflicts, then this level of efficiency cannot be obtained. Therefore, part of any investment in new equipment and improvements to physical plant will be partially wasted unless there are adequate personnel resources available to maximize the rail industry's use in a crisis.

FINAL ANALYSIS

The railway's primary contribution to national defense is its ability to handle a greatly expanded volume of freight traffic and to do this without a corresponding increase in equipment or physical plant. Due to unused rail cars in the Depression, U.S. rails doubled the freight volume hauled in 1944 over that of 1939 with only an increase of four percent of rolling stock and motive power in the same period.¹¹ Today there is no surplus of rolling stock available to this nation to serve in defense emergencies. Nor is there a builder capacity available to produce the needed additional rolling stock as fast as freight volume could increase.

Regardless of the era's technology and the military strategy, rail transportation would continue to be the largest mover of goods during national mobilization. Not only do U.S. railroads take on increased importance during mobilization but also accomplish the bulk shipment of freight economically in fuel and manpower for a given quantity of freight moved. In wartime both fuel and manpower have to be allocated and conserved judiciously to sustain a national effort with a reasonable degree of success in the long run. Today our fuel and manpower reserves are more critical than ever and greater care must be planned to husband this nation's resources during a mobilization. Fuel is the lifeblood of our economy and our human resources are our most precious resource. Therefore, U.S. railroads should be recognized by strategic planners as the hub of military freight transportation planning within the nation; and, that adequate precautions be taken to facilitate a changeover of our total transportation assets to a wartime footing that would contribute most to this nation with a minimum commitment of essential resources.

Military Traffic Management Command (MTMC) studied the U.S. rail system to determine defense needs to support the military. The study's report was published in 1976 designating a core U.S. defense rail system entitled

"Strategic Rail Corridor Network" (STRACNET). This core system identified those routes needed in peacetime to serve the Department of Defense (DOD) and those DOD installations needing connecting rail service.¹² This study and the resultant designation of a U.S. strategic rail network certainly is a step in the correct direction in determining our adequacy of a minimum rail system servicing our defense needs. But this study neither goes far enough nor determines the real problem.

The core of the problem is the lack of rail cars to haul a significant increase in rail freight traffic expected during a mobilization. The problem is not if we have enough track available within CONUS or if the DOD installations needing rail have spurs to them or not. It is nice to know that we have identified the most crucial thirty thousand miles of track for peacetime requirements when all trackage is potentially important in a mobilization effort. In this age the redundancy of our rail network is a great strength to withstand the expectant interdiction in a major conflict. What is most important--the limiting factor--is that U.S. railroads can essentially haul that amount of freight with the rolling stock now available and not a whole lot more. The true potential of the track capacity is much higher.

As for STRACNET, having spurs or not to defense installations is not the most critical factor if there are not enough cars to haul that additional freight. If a DOD installation does not have a spur, a rail head can be established within a reasonable distance to load necessary goods, equipment and other materiel. But there has got to be enough rolling stock of the right types to truly realize the U.S. railways' full defense capability for mobilization.

Today's U.S. freight car fleet is more highly specialized than ever in our history. Much of that fleet may not be readily acceptable to defense related cargoes as well as the general-use box cars and chain tie-down flat cars are. If there are not enough rail cars of the right types for defense, a study should

determine potential defense mobilization requirements for rolling stock. If it is further decided to stockpile cars, then only those needed freight cars that are nonexistent or in very limited quantities in peacetime would be placed in a reserve fleet. This would ensure our defense planners that essential defense-only type cars are available for a future mobilization.

Even if the armed services resort more to containerization, the need for connecting spurs to DOD installations is further reduced. Also this would be more the reason to focus on an adequate number of freight cars to support a mobilization.

The final analysis is that all previous studies and planning appears to have addressed many aspects of our defense rail requirements but not the central problem of insufficient freight cars for mobilization. Without enough additional freight cars for an all-out mobilization, our nation's railroads together are no longer as strong a defense asset. This is not to say that it cannot absorb any additional traffic, for it can, but that U.S. railroads collectively cannot contribute to U.S. defense as it once could and did. This is not the rail industry's fault but primarily government by not determining the real problem and finding a feasible solution.

There are solutions to this problem, some of which may be very cost effective. Possible solutions will not be addressed in this article because of time and space limitations here, yet all alternatives should be explored and an affordable and feasible plan devised to enable U.S. railroads to meet both defense and domestic freight requirements for an extended national emergency, i.e., mobilization.

CONCLUSION

U.S. railroads were created and exist only for one reason—to haul merchandise, goods and raw materials to support U.S. industry and the American people. Mobilization changes the traffic patterns because of the transition

from peacetime to wartime production and usages. The daily problems of wartime railroad operations are very nearly like those encountered in peacetime, that is the same type of problems trained personnel experience in railroading over the years.

History reveals that railroads are the largest mode of transportation for freight during mobilization because of its relative security, flexibility, potential capacity and its efficient use of scarce resources. There is no concrete evidence that this will change in future conflicts. Wartime does not increase so much the total transportation requirements, but it does change significantly the type and quantity of commodities and goods produced with its resulting change in traffic volume and patterns among the various modes of transportation. Thus the U.S. rail service's chief contribution as a military asset is a potential to absorb the greatest increase in freight volume with the least commitment of resources crucial to national survival.

Yet, due to a lack of sufficient freight cars, U.S. railroads today do not have an adequate number to handle a greatly expanded volume of rail traffic in a mobilization. The increase in volume will occur faster than freight cars can be built to meet the anticipated levels. U.S. railroads will still be able to provide yeoman service any defense mobilization but its total contribution can only be extended so far before it will reach its limit. Even with a significantly high equipment utilization, the needed 50 to 60 percent increase in rail traffic volume to occur after two or three years of mobilization cannot possibly be met with the existing car fleet and freight car building capacity.

In the past, there have been expressed concerns about manpower and natural resource constraints on this nation in any future conflict. If a mobilization should occur and this nation does not plan for and anticipate transportation requirements expected in such an event, we may find ourselves forced into allocating manpower and fuel resources to some transportation modes that uses them

at a much higher rate than rail services do for a given freight volume. This does not say that it cannot be done if necessary, but this should not be done if it can be avoided. Right now precisely that will occur during a full mobilization.

If a decision is made to let each transportation mode "run its course" during a mobilization, then we are indeed fortunate to live in a country with enough vital resources crucial for national survival that a very economical transportation user of these resources will not be maximized. Rail service's superior economy and its great potential for a large increase in traffic volume make the U.S. railroads a military factor and should be planned for accordingly.

U.S. railroads are a military asset for the deployment and sustainment of our defense forces as well as for the sustainment of our domestic and wartime industrial production base.

Table 1. Intercity Freight Traffic in WWII¹³

(in billions of ton-miles)

<u>Year</u>	<u>Air</u>	<u>Truck</u>	<u>Inland waters</u>	<u>Coastal & inter- coastal</u>	<u>Pipe- lines</u>	<u>Rail- roads</u>	<u>Total</u>	<u>% above 1941</u>	<u>Rail % in- crease</u>	<u>Rail % of Total</u>
1941	-	81	140	241	68	521	1052	-	-	49.5
1942	-	60	149	86	75	689	1059	0.6	32.2	65.1
1943	-	56	142	54	98	780	1131	7.6	49.7	69.0
1944	-	58	150	57	133	795	1193	13.4	52.6	66.6

Table 2. Intercity Freight Traffic Anticipated in 1955 Study¹⁴

(in billions of ton-miles)

<u>Year</u>	<u>Air</u>	<u>Truck</u>	<u>Inland waters</u>	<u>Coastal & inter- coastal</u>	<u>Pipe- lines</u>	<u>Rail- roads</u>	<u>Total</u>	<u>% above 1953</u>	<u>Rail % in- crease</u>	<u>Rail % of Total</u>
1953	-	207	190	250	166	642	1455	-	-	44.1
Yr. 1	-	195	195	150	170	845	1555	6.8	31.6	54.4
Yr. 2	-	185	197	60	195	987	1624	11.5	53.7	60.8
Yr. 3	-	170	200	70	235	1062	1737	19.3	65.4	61.1

Table 3. Intercity Freight Traffic in 1983 and Assumed¹⁵
Mobilization Increases for Three Years

(in billions of ton-miles)

<u>Year</u>	<u>Air</u>	<u>Truck</u>	<u>Inland waters</u>	<u>Coastal & inter- coastal</u>	<u>Pipe- lines</u>	<u>Rail- roads</u>	<u>Total</u>	<u>% above 1983</u>	<u>Rail % of Total</u>
1983	6	551	360	665	566	839	2987	-	28.1
Yr. 1						*969	3136	5	
Yr. 2						1062	3286	10	
Yr. 3						1142	3435	15	

*Determined from table 4.

Table 4. Freight Car Assumptive Utilization and Volume Capacity for Mobilization

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>
1. Total freight cars owned @ 1st of year (estimated)	1,500,000	1,552,500	1,612,750
2. New cars built (estimated)	77,500	85,250	93,000
3. Cars retired (estimated)	25,000	25,000	25,000
4. Average no. of cars owned, annually	1,526,250	1,582,625	1,646,750
5. Bad order (assumed about 3%)	45,000	45,000	45,000
6. Serviceable cars available	1,481,250	1,537,625	1,601,750
7. Tons per car loaded	63	64	64
8. Length of haul (miles)	640	650	655
9. Days turn-around	22.5	22.0	21.5
10. Trips per year (365 + line 9)	16.2	16.6	17.0
11. Ton-miles per car loaded (line 7 X line 8)	40,320	41,600	41,920
12. Ton-miles per car per year (line 10 X line 11)	654,080	690,560	712,640
13. Volume capacity (line 6 X line 12) (billions ton-miles/year)	968.9	1,061.8	1,141.5
14. % increase above base year 1983	15.5	26.6	36.1

ENDNOTES

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5. Freight and passenger data compiled from Headquarters, Military Transportation Management and Terminal Service annual reports for FY 67-70, inclusive.
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8. U.S. Office of Defense Mobilization; Findings and Recommendations of the Consultants Committee on Railroad Equipment, 1955; Sheet No. 101647.
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14. Ibid.
15. AAR, Railroad Facts, 1984 Edition; p. 32.